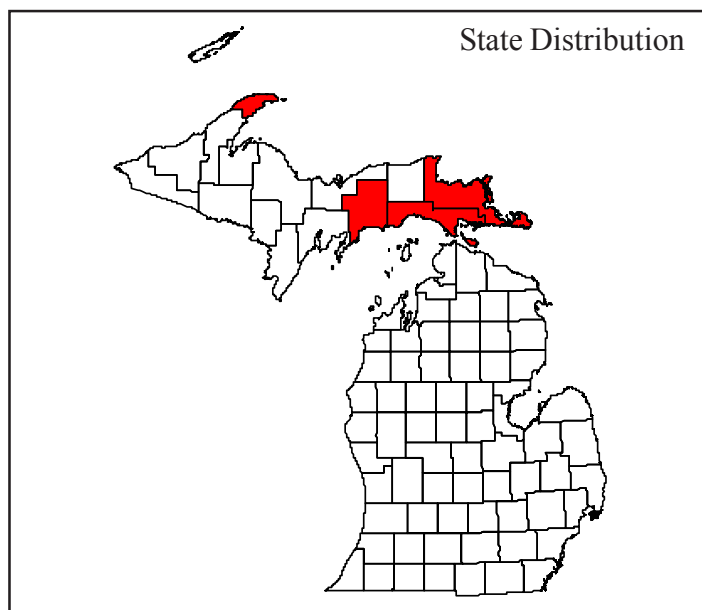
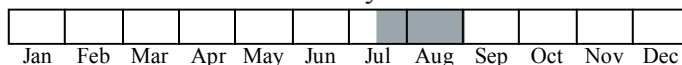


male

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Best Survey Period



**Status:** State special concern

**Global and state rank:** G3/S1S2

**Family:** Corduliidae (emerald dragonfly family)

**Range:** This species is one of our rarest North American dragonflies. It is known only from Ontario and Nova Scotia in Canada and Maine, Pennsylvania, Wisconsin, and northern Michigan in the United States.

**State distribution:** In Michigan, this dragonfly is currently known from only seven sites in five counties in the Upper Peninsula. Three of the sites are located in Chippewa County. However, this species has not been systematically surveyed, and may occur in additional counties in which suitable habitat is available.

**Recognition:** The incurvate emerald is above-average in size for the *Somatochlora* genus (total length about 63 mm or 2 inches) (Shiffer 1985). The **face is yellowish-brown with dark, metallic greenish markings and large, green eyes.** The **thorax (upper body) is brown with metallic blue-green reflections and a pair of yellowish-brown elongate spots on each side.** The **abdomen (lower body) is black with a dull greenish sheen, with pale areas on sides of segments 2 and 3, and smaller dull yellow-brown spots on the rear portions of segments 4 to 9.** The legs are **black, and brownish at the base.**

There are nine other species of emerald dragonflies that occur in the Upper Peninsula in Michigan. Several of these occur in the same habitats and fly at the same time as the incurvate emerald, including the federally and state endan-

gered Hine's emerald (*Somatochlora hineana*). The adults of these different species can only be reliably distinguished by their genitalia. Therefore, the only way to positively identify the incurvate emerald is to collect a specimen and have it verified by an expert.

**Best survey time:** The best time to survey for adults is from mid-July through August. Males are usually seen during sunny weather conditions from mid-morning to mid-afternoon (Shiffer 1985). In contrast, females appear to be most active on warm, but overcast, days when very few males are evident. Adults are best sampled with the use of a mesh aerial net.

**Habitat:** This species is typically associated with small pools of spring water in sphagnum bogs (Shiffer 1985). In Michigan, this species also has been found in patterned peatlands and northern fens. These wetlands are associated with peat or marl and contain flowing groundwater rich in calcium and magnesium carbonates. Dominant vegetation in these communities includes sedges (*Carex* spp.), bul-rushes (*Scirpus* spp.), rushes (*Eleocharis* spp.), and shrubby cinquefoil (*Potentilla fruticosa*). Northern fens also contain calciphiles such as false asphodel (*Tofieldia glutinosa*) and grass-of-parnassus (*Parnassia glauca*) and bog plants such as leatherleaf (*Chamaedaphne calyculata*), Labrador tea (*Ledum groenlandicum*), and small cranberry (*Vaccinium oxycoccos*). These wetland communities are often bordered by forest such as rich conifer swamps and white cedar (*Thuja occidentalis*).

**Biology:** The incurvate emerald was first documented in Michigan (and in the U.S.) in Chippewa County in the early to mid-1900's, and was only recently rediscovered in



the state in 1993. Very little is currently known about the incurvate emerald. Adults have been seen flying from mid-July to mid-October (Walker and Corbet 1975). Males fly randomly just above the vegetation, occasionally perching on tree branches or hovering over open pools (Shiffer 1985). Females fly among the shrubs in a more direct manner, seeking open pools in which to oviposit. Females oviposit by hovering alone close to the water or wet mud, turning slowly in an irregular fashion and dipping the abdomen to the surface at closely spaced intervals.

The nymph stage and the time needed for egg development in this species are currently unknown. It is believed that the eggs probably hatch the following spring or summer after being deposited, and that the nymphs require at least two winters to reach maturity (Shiffer 1985). Similar to other species in its genus, the nymphs most likely transform into adults by crawling onto vegetation close to the water or on sphagnum moss.

Adults appear to remain fairly close to breeding sites (Shiffer 1985). Walker (1925) observed thousands of incurvate emeralds swarming on a beach along the shore of Lake Superior during the day, when the wind was offshore, but in a clearing about a quarter of a mile away from the lake at the end of a warm day. He observed the incurvate emeralds flying with swarms of darners (*Aeshna*) and other species of emerald dragonflies such as the delicate emerald (*S. franklini*) and Williamson's emerald (*S. williamsoni*).

The incurvate emerald probably feeds on small insects, such as midges, which are usually captured and eaten during flight (Walker 1925). Larger dragonflies and insectivorous birds are likely predators for this species.

**Conservation/management:** The most likely threat to this species is habitat loss and alteration. For example, commercial and residential development have resulted in the destruction and/or alteration of numerous wetlands in the state. Given that this species has been recorded from so few sites in Michigan and across its range, all known populations should be protected at this time. Maintaining the ecological integrity of the habitat is most important for the continued survival of this species at a site (Shiffer 1985). It is important to maintain the hydrology and water quality of an occupied site. Clearcutting adjacent to occupied sites may adversely impact the incurvate emerald and a number of invertebrate species by altering the site's microclimate (e.g., loss of proper humidity gradient) and reducing the amount of feeding habitat and shelter during the maturation period prior to breeding. Maintaining a no-cut or selective cut buffer around the wetlands would help minimize the potential for adversely impacting this and associated species.

**Research needs:** A systematic survey is needed to identify additional occupied sites and to determine this species' status and distribution in the state. Known sites should be revisited and monitored. Information on the life history and ecology of the incurvate emerald dragonfly is crucial to

better understand its ecological requirements and to assess the potential for impacts on this species from various land use and management activities. Research should particularly focus on the identification, biology and habitat requirements of the larvae. A formal description of the incurvate emerald dragonfly larva is needed so that it can be distinguished from that of other species.



female

**Related abstracts:** Hine's emerald dragonfly

### Selected references

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### Abstract citation

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